

# NASA TECH BRIEF

## *Lewis Research Center*



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### **A Computer Program for Calculating Design and Off-Design Performance of Two- and Three-Spool Turbofans with as Many as Three Nozzles**

A computer program, GENENG II, has been developed which calculates the performance of two- or three-spool turbofan engines with as many as three nozzles (or airstreams). The program uses component performance maps to enable the user to do analytical engine cycle calculations. Through a sealing procedure, each of the component maps can be used to represent a family of maps (different design values of pressure ratios, efficiency, weight flow, etc.). Either convergent or convergent-divergent nozzles may be used.

#### **Notes:**

1. The program is written in FORTRAN IV for the IBM 7094 Mod 2 computer. With modifications, the program can be used on all machines that have a FORTRAN compiler.
2. An antecedent program, GENENG, calculates steady-state design and off-design performance for turbofan and one- and two-spool turbojet engines, Reference: LEW-12010.
3. Inquiries concerning these programs should be directed to:

COSMIC  
Information Services  
112 Barrow Hall  
University of Georgia  
Athens, Georgia 30602  
Reference: LEW-12011

Source: L.H. Fishbach and R.W. Koenig  
Lewis Research Center  
(LEW-12011)

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### Performance of Two-Stage Thrust Vectoring with a Thrust Vectoring

The purpose of this study was to determine the effect of two-stage thrust vectoring on the performance of a rocket engine. The study was conducted using a two-dimensional flow field analysis. The results show that the two-stage thrust vectoring technique can improve the performance of a rocket engine by increasing the thrust and reducing the fuel consumption. The study also shows that the two-stage thrust vectoring technique can be used to control the direction of the thrust vector.

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